Amendments To The Claims

Claim 1 (Currently Amended): A microphone system comprising:

a plurality of ~~colinear~~ collinear microphones regularly spaced according to ~~a~~ ~~plurality~~ pluralities of distinct spacings with a common center;

a plurality of microphone signal adders, wherein the microphones of each set of microphones having one of said spacings are connected to the same signal adder;

a plurality of first filters, each connected to receive [[the]] an output of a corresponding one of the ~~microphones~~ microphone signal adders;

a plurality of second filters each connected to an output of one of the microphones such that each microphone is connected to the microphone signal adder through the second filter, wherein each of the second filters implements one of a plurality of windowing functions that are each a function of one of the pluralities of spacings associated with the one of the microphones with which the second filter is connected; and

an output adder connected to receive the output of the first filters and supply the combined signal as an output, wherein the frequency response of the first filters is such that the combined signal is flat over a selected frequency range in a selected direction.

Claim 2 (Canceled)

Claim 3 (Canceled)

Claim 4 (Currently Amended): The microphone system of claim [[2]] 1, wherein the windowing functions are Kaiser-Bessel window functions.

Claim 5 (Currently Amended): The microphone system of claim [[2]] 1, wherein the second filters implement a delay.

Claim 6 (Original): The microphone system of claim 5, wherein the delay of a given second filter is proportional to the spacing of the set of microphones to which the microphone it belongs corresponds, and wherein all the second filters depend upon the same function of a steering angle.

Claim 7 (Original): The microphone system of claim 1, wherein the frequency response of each of the first filters is a continuous function of frequency, the response of the first filter corresponding to the smallest spacing being zero below a first frequency, constant above a second frequency and linear between the first and second frequency, the response of the first filter corresponding to the largest spacing being zero above a third frequency, constant below a fourth frequency and linear between the third and fourth frequency, and wherein for each of the other first filters, the response is zero outside of a respective frequency range and inside the respective frequency range linearly increasing below a respective intermediate frequency and linearly decreasing above the respective intermediate frequency.

Claim 8 (Original): The microphone system of claim 1, wherein the selected frequency range is greater than five octaves.

Claim 9 (Original): The microphone system of claim 1, wherein the selected frequency range is from 20 hertz to 20 kilohertz.

Claim 10 (Original): The microphone system of claim 1, wherein the number of spacings is N and the spacings are $2^{(i-1)}d$, where i runs from one to N and d is the smallest spacing.

Claim 11 (Original): The microphone system of claim 10, wherein N is equal to nine.

Claim 12 (Original): The microphone system of claim 10, wherein d is in a range of 0.5 centimeters to ten centimeter.

Claim 13 (Original): The microphone system of claim 10, wherein the number of microphones corresponding to each of the spacings is three or more.

Claim 14 (Original): The microphone system of claim 13, wherein a microphone belongs to a plurality of the sets of microphones having one of said spacings.

Claim 15 (Original): The microphone system of claim 1, further comprising:

a second plurality of microphone signal adders, wherein the microphones of each set of microphones having one of said spacings are connected to the same second signal adder;

a second plurality of first filters, each connected to receive the output of a corresponding one of the second microphones signal adders; and

an second output adder connected to receive the output of the second plurality of first filters and supply the combined signal as a second output, wherein the frequency response of the second plurality of first filters is such that the combined signal is flat over a selected frequency range in a second selected direction.

Claim 16 (Currently Amended): A microphone system comprising:

a planar array of a plurality of microphones regularly spaced in the direction of a first axis according to ~~a plurality~~ pluralities of first spacings centered on a second axis and regularly spaced in the direction of the second axis according to ~~a plurality~~ pluralities of second spacings centered on the first axis, wherein the axes are nondegenerate;

a plurality of microphone signal adders, wherein the microphones of each set of microphones forming a line having one of said spacings parallel to one of said axes are connected to the same adder;

a plurality of first filters, each connected to receive the output of a corresponding one of the microphones signal adders; [[and]]

an output adder connected to receive the output of the filters and supply the combined signal as an output; and

wherein a first set of microphones is configured to produce cardioid pickups in a first direction, and a second set of microphones configured to produce cardioid pickup in a second direction opposite the first direction such that the planar array establishes substantially equal angular resolution in both the first and second directions.

Claim 17 (Original): The microphone system of claim 16, further comprising: a plurality of second filters, wherein each of the connections of one of the microphones to one of the microphone signal adders is made through one of the second filters.

Claim 18 (Original): The microphone system of claim 17, wherein the second filters implement windowing functions.

Claim 19 (Original): The microphone system of claim 17, wherein the windowing functions are Kaiser-Bessel window functions.

Claim 20 (Original): The microphone system of claim 17, wherein the second filters implement a delay.

Claim 21 (Original): The microphone system of claim 20, wherein the delay of a given second filter is proportional to the spacing of the set of microphones to which the microphone it belongs corresponds, and wherein all the second filters depend upon the same function of a set of steering angle.

Claim 22 (Original) The microphone system of claim 16, wherein the frequency response of each of the first filters is a continuous function of frequency, the response of the first filter corresponding to the smallest spacing being zero below a first frequency, constant above a second frequency and linear between the first and second frequency, the response of the first filter corresponding to the largest spacing being zero above a third frequency, constant below a fourth frequency and linear between the third and fourth frequency, and wherein for each of the other first filters, the response is zero outside of a respective frequency range and inside the respective frequency range linearly increasing below a respective intermediate frequency and linearly decreasing above the respective intermediate frequency.

Claim 23 (Original): The microphone system of claim 16, wherein the selected frequency range is greater than five octaves.

Claim 24 (Original): The microphone system of claim 16, wherein the selected frequency range is from 20 hertz to 20 kilohertz.

Claim 25 (Original): The microphone system of claim 16, wherein the number of first spacings is N_1 and the first spacings are $2^{(i-1)}d_1$, where i runs from one to N_1 and d_1 is the smallest spacing in the direction of the first axis, and , wherein the number of second spacings is N_2 and the second spacings are $2^{(j-1)}d_2$, where j runs from one to N_2 and d_2 is the smallest spacing in the direction of the second axis.

Claim 26 (Original): The microphone system of claim 25, wherein N_1 and N_2 are equal to nine.

Claim 27 (Original): The microphone system of claim 25, wherein d_1 and d_2 are in a range of 0.5 centimeters to ten centimeter.

Claim 28 (Original): The microphone system of claim 25, wherein the number of microphones corresponding to each of the first and second spacings is three or more.

Claim 29 (Original): The microphone system of claim 28, wherein a microphone belongs to a plurality of the sets of microphones having one of said spacings.

Claim 30 (Original): The microphone system of claim 25, wherein d_1 is equal to d_2.

Claim 31 (Original): The microphone system of claim 16, wherein the axes are orthogonal.

Claim 32 (Canceled)

Claim 33 (Original): A microphone system comprising a number of the microphone systems of claim 16, wherein the planar arrays are non-coplanar and the number is two or more.

Claim 34 (Original): The microphone system of claim 33 wherein number is two, wherein the planar arrays are orthogonal, and wherein the axes in the planar arrays are orthogonal.

Claim 35 (Currently Amended): A method of providing a directional response to a sonic input that is flat over a frequency range, comprising:

receiving the sonic input at a plurality of microphones, wherein the microphones are arranged according to ~~a plurality~~ pluralities of distinct regular spacings;

for each of the spacings, combining the responses of the corresponding microphones to the sonic input;

filtering each of the combined responses with a frequency response dependent upon the respective spacing; [[and]]

combining the filtered responses, where the frequency responses of the filters is such that the combined output is flat over the frequency range in a selected direction;

supplying a plurality of voltages to a first set of microphones to produce cardioid pickups in a first direction;

supplying a plurality of voltages to a second set of microphones to produce cardioid pickups in a second direction opposite the first direction such that a sonic input is detected on opposite sides of the first and second sets of microphones with a substantially equal angular resolution.

Claim 36 (Original): The method of claim 35, further comprising:
filtering the responses of the microphones with windowing filters prior to combing the responses.

Claim 37 (Original): The method of claim 36, wherein the windowing filters are Kaiser-Bessel window filters.

Claim 38 (Original): The method of claim 35, further comprising:
selecting a direction;

causing the delay of the responses of the microphones prior to combing the responses, whereby directional response to the audio signal is peaked in the selected direction.

Claim 39 (Original): The method of claim 35, wherein the frequency range is greater than five octaves.

Claim 40 (Original): The method of claim 35, wherein the frequency range is from 20 hertz to 20 kilohertz.

Claim 41 (Currently Amended): A method of providing a directional audio response that is flat over a frequency range, comprising:

providing a plurality of microphones;

arranging the microphones according to ~~a plurality~~ pluralities of distinct regular spacings;

applying one of a plurality of windowing functions to an output of each of the plurality of microphones, wherein each of the windowing functions is a function of one of the pluralities of spacings associated with the microphone with which the windowing

function is applying;

combining the outputs of the microphones of each spacing to provide a respective combined signal for that spacing;

filtering each of the combined outputs according to a respective frequency response; and

combining the filtered combined outputs, where the spacings and the respective filter responses are related such that the combined filtered output is flat over the frequency range.

Claim 42 (Currently Amended): The method of claim 41, wherein the microphones are arranged ~~colinearly~~ collinearly and the distinct spacings share a common center.

Claim 43 (Original): The method of claim 42, wherein the number of spacings is N and the spacings are $2^{(i-1)}d$, where i runs from one to N and d is the smallest spacing.

Claim 44 (Original): The method of claim 43, wherein N is equal to nine.

Claim 45 (Original): The method of claim 43, wherein d is in a range of 0.5 centimeters to ten centimeter.

Claim 46 (Original): The method of claim 43, wherein the number of microphones corresponding to each of the spacings is three or more.

Claim 47 (Canceled)

Claim 48 (Original): The method of claim 47, wherein the windowing filters are Kaiser-Bessel window filters.

Claim 49 (Original): The method of claim 41, further comprising:
delaying outputs of the microphones prior to combing the outputs of the microphones, whereby audio response is peaked in a selected direction.

Claim 50 (Original): The method of claim 49 wherein the delay is proportional to the spacing of the set of microphones to which the microphone it belongs corresponds, and wherein all the second filters depend upon the same function of a steering angle.

Claim 51 (Original): The method of claim 41, wherein the respective frequency response corresponding to the smallest spacing is zero below a first frequency, constant above a second frequency and linear between the first and second frequency, wherein the respective frequency response corresponding to the largest spacing is zero above a third frequency, constant below a fourth frequency and linear between the third and fourth frequency, and wherein the respective frequency response corresponding to the other spacings is zero outside of a respective frequency range and inside the respective frequency range linearly increasing below a respective intermediate frequency and linearly decreasing above the respective intermediate frequency.

Claim 52 (Original): The method of claim 41, wherein the selected frequency range is greater than five octaves.

Claim 53 (Original): The method of claim 41, wherein the selected frequency range is from 20 hertz to 20 kilohertz.

Claim 54 (Currently Amended): The method of claim 41, wherein the microphones are arranged in one or more planar arrays, the microphones of each planar array being regularly spaced in the direction of a first axis according to a plurality of first spacings centered on a second axis and regularly spaced in the direction of the second axis according to a plurality of second spacings centered on the first axis, wherein the axes of each planar array are nondegenerate~~ and the planar arrays are nondegenerate~~.

Claim 55 (Currently Amended): A method of providing an audio signal comprising:

causing to be provided a plurality of signals from an array of microphones arranged according to a plurality of regular spacings;

providing a direction;

delaying the signals within each spacing relative to each other;

equalizing the main lobe of each microphone output by applying one of a plurality of windowing functions relating to the spacing of the microphone;

combining the delayed signals within of each spacing, wherein the delays are such that the combined signal of each spacing has a directional response centered at the direction;

filtering the combined signals according to a respective filter response; and

combining the filtered combined signals, where the spacings and the filter responses are related such that the combined filtered output is flat over the frequency range.

Claim 56 (Original): The method of claim 55, wherein the plurality of signals from an array of microphones are provided from a pre-recording of said signals.